Final White Paper:

EOS Ground System (EGS) Status Review (ESR)

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Prepared for

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland

Prepared by

Computer Sciences Corporation
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Introduction: This paper proposes an approach to providing increased visibility at a system level into the EOS Ground System (EGS) definition, development, integration, and test activities. The EGS results from the integration of EOSDIS with institutional support systems and other external organizations, culminating in a fully integrated and certified system that meets specific Mission to Planet Earth mission goals. As defined by the EOS Project Plan, the EOSDIS is comprised of the EOS Core System (ECS), EOS Data and Operations System (EDOS), EOSDIS Backbone Network (EBnet), Distributed Active Archive Centers (DAACs), Version 0, EOSDIS Test System (ETS), and science software, and Science Computing Facilities (SCFs).

Current EGS Development Approach: The ESDIS Project has responsibility for development of the EOS Data and Information System (EOSDIS). The three main components of EOSDIS are being implemented under three separate development contracts by different development contractors. Each of these has specific requirements and implementation schedules. It is the responsibility of the ESDIS Development Office of the ESDIS Project to oversee and coordinate development to assure that the resulting system adequately supports data management and distribution for the Mission to Planet Earth Program and flight operations for the EOS missions. The ESDIS Project System Management Office (SMO) has responsibility for providing specifications and requirements, for planning and conducting EGS integration and test, and for certifying EGS readiness to conduct mission operations.

Since each EOSDIS component is being developed separately, each has its own set of reviews planned and scheduled. The review schedules are not necessarily consistent with each other. Additionally, for various technical and budgetary reasons, the development schedules of some EOSDIS elements undergo frequent replanning. The current status of the EOSDIS component reviews is shown in Figure 1.

The currently scheduled reviews typically address component requirements and interfaces with other EOSDIS components, but only from the point of view of the individual component under review. They do not address the following questions:

- Is the EGS system-level requirements baseline as defined adequate and appropriately allocated to support TRMM, EOS AM-1, and Landsat-7?
- Can the EGS components as currently designed be integrated into a system that will meet all EGS requirements?
- Will the component development and acceptance schedules as currently defined allow for the integration, test, and certification of multiple EGS Versions consistent with scheduled launch dates?
- How will the integration and test and the certification testing of the overall ground system be done to ensure adequate support for each mission?
- Will the overall system meet the operational needs of all of its users?

- Will operability for ongoing missions be maintained as new EGS Versions are brought on-line?

Figure 1 - EOSDIS Component Review Schedule

Component	Review Event	Scheduled Date
ECS	Contract Award	March, 1993
	SRR	September, 1993
	SDR	June, 1994
	Release A PDR Wrap-Up	February, 1995
	Release A SDPS/CSMS CDR	August, 1995
	Release A/B FOS CDR	October 1995
	Release B SDPS/CSMS CDR	April 1996
EDOS	Contract Award	September, 1994
	SRR	April, 1995
	System Design Workshops (Complete)	November, 1995
EBnet (formerly ECOM)	SRR (ECOM)	January, 1993
	SDR (ECOM)	February, 1994
	EBnet Review	October, 1995
ETS	Delta SRR	December, 1994
	SDR	May, 1995
	PDR	October 1995
	CDR	January 1996

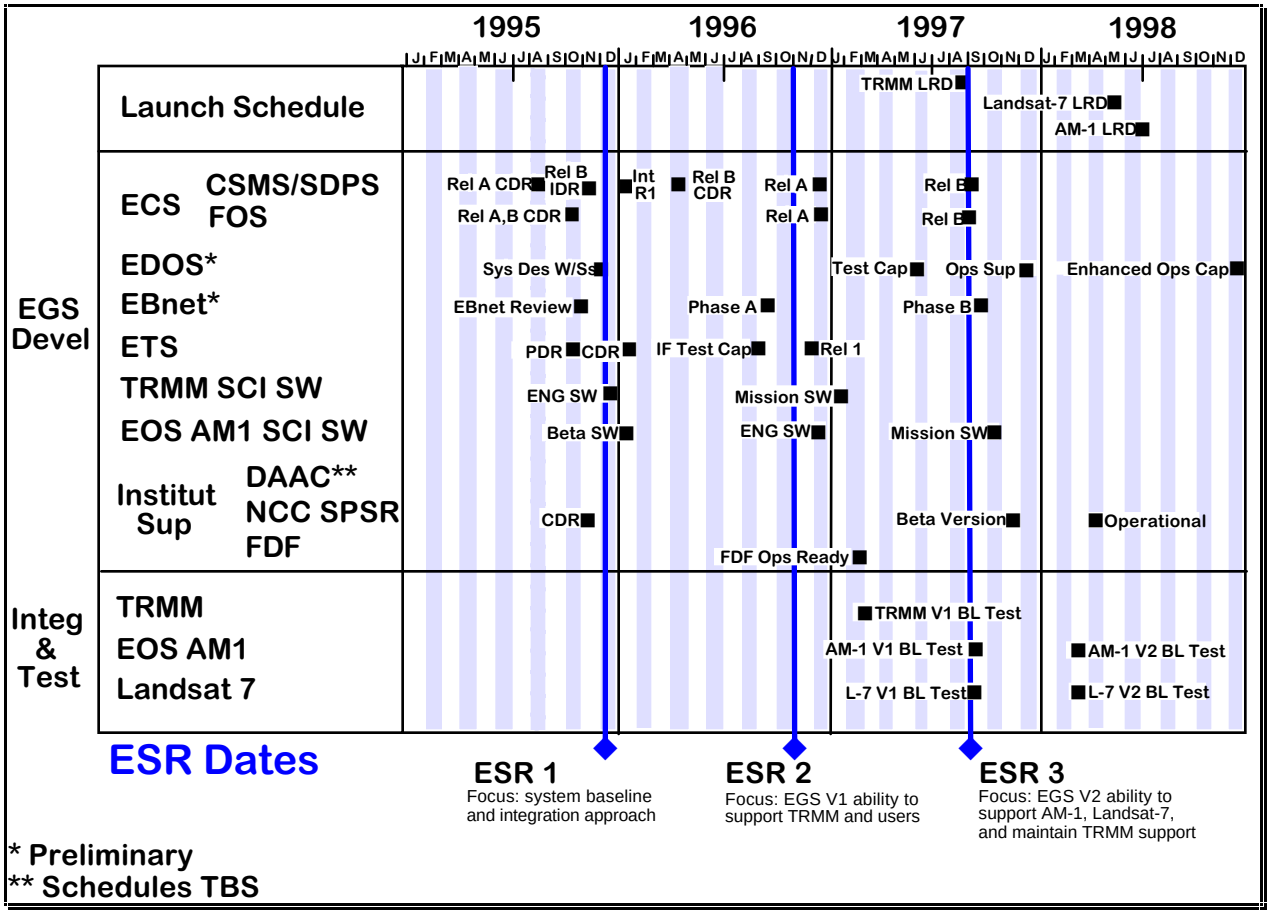
Proposed EOS Ground System (EGS) Status Reviews (ESRs): Reviews that examine the EGS from a system perspective as opposed to the component perspective are needed to address the questions above. The reviews should occur periodically to assure adequate visibility into the progress and status of EGS development. The reviews should not duplicate material presented in component design and operations reviews, but focus on:

- Requirement definition and allocation for each specific mission, including requirement needs of the general user community
- EGS operations concepts and scenarios for end-to-end support
- Status of component implementation efforts, with any risks or issues that have been identified.
- Plans for and status of system integration and test activities and system certification activities
- Assurance of operability for ongoing missions as EGS is enhanced

The primary goal of these reviews should be to define the activities related to system engineering, development, integration, test, and certification efforts associated with EOSDIS and required to implement the EGS and to provide current activity status.

A series of three EOS Ground System Status Reviews of approximately 2 days duration each are proposed to meet these goals. The proposed schedule is shown in Figure 2.

Figure 2 - ESR Schedule



ESR 1 - The first ESR would focus on the baseline design and system integration approach. It would verify that

- requirements are properly allocated to the planned component deliveries to meet mission needs
- the operational concept and scenarios are adequate to support planned missions and general user needs
- a feasible plan for EGS integration and test is defined and in implementation
- known and predictable risks have been identified, quantified, and mitigated to the extent possible

It is suggested that ESR 1 be held after the CDRs for most major components have been completed. The date will be finalized based on negotiations with ESDIS project elements and other considerations (e.g., coupling the review with activities planned workshops and avoiding scheduling conflicts with component development and integration activities.) Although additional benefits could be obtained by having the first review earlier, early December, 1995, is the recommended timeframe. Based on current schedules, by early December the major components would be in the implementation phase and interface requirements documents would be completed. There would also be time to analyze the integration and test plans for adequacy

prior to the review. Sufficient implementation time should be available following the review to effect any modifications necessitated by problem identification.

ESR 2 - The second ESR would focus on the EGS Version 1 ability to support TRMM, with a secondary focus on preparation for AM-1 and Landsat-7. It would verify that

- EGS Version 1 is on schedule and reflects the approved Program changes as appropriate
- the capabilities necessary to support TRMM are being provided
- other capabilities scheduled for Version 1, including initiation of Version 0 data set migration, AM-1 and Landsat-7 interface support, and user support, are being provided
- the operational concept and scenarios have been refined to support TRMM and general user needs
- the Version 1 integration and test approach is adequate to validate system requirements and verify system performance
- all identified risks associated with the support of TRMM or with other scheduled capabilities have been adequately mitigated

The actual date of ESR 2 will be finalized based on negotiations with ESDIS project elements and other considerations. It is tentatively scheduled for October, 1996, following the initial integration and interface test activity and shortly before integration and test of the final EGS Version 1 (ECS Release A and TRMM Mission Software). This would allow the review to incorporate what was learned from integrating the ECS interim release 1 and TRMM Engineering Software performing interface testing. It would provide insight into potential problems associated with the interface of ground system components. Having the review just before integration of the final support software would ensure up-to-date status of the software. Because the review will be held about 10 months prior to TRMM LRD, sufficient time should be available to resolve any critical problems associated with supporting the mission.

ESR 3 - The third ESR would focus on the EGS Version 2 ability to support EOS AM-1 and Landsat-7. It would verify that

- EGS Version 2 is on schedule and reflects the approved Program changes
- the capabilities necessary to support EOS AM-1 and Landsat-7 are being provided and TRMM capabilities are unaffected
- other capabilities scheduled for Version 2, including flight of opportunity support, are being provided
- the operational concept and scenarios have been refined to support TRMM, EOS AM-1, Landsat-7, flights of opportunity, and general user needs without impact to any of the other planned missions
- the Version 2 integration and test approach is adequate to validate system requirements and verify system performance without impacting TRMM mission support
- identified risks associated with the support of EOS AM-1 and Landsat-7 or with other scheduled capabilities have been adequately mitigated
- the system can sustain ongoing mission support as well as the additional mission support associated with EOS AM-1 and Landsat-7

The actual date of ESR 3 will be finalized based on negotiations with ESDIS project elements and other considerations (like the planned TRMM launch date.) It is tentatively scheduled for July or August, 1997, toward the end of interface testing for AM-1 and Landsat-7. Holding the review after initial integration and interface testing of EGS Version 2 provides better insight into potential problems associated with overall integration and interfaces of Version 2. Having it just before integration of the final support software ensures up-to-date status of final components. Because the review will be held about 9 months before Landsat LRD and 10 months before EOS AM-1 LRD, sufficient time should be available to resolve any critical problems associated with supporting either mission.

By occurring about every 10 months these reviews would provide periodic insight into the status and potential risks of providing an integrated ground system to support the planned missions. By emphasizing the adequacy of the system baseline definition and the plans for integration and test, these reviews would focus on the ability of the integrated EGS to meet mission and user needs. The reviews would be supported by the development contractors and by the organizations performing the systems engineering and test activities for EGS.

These reviews are in addition to the planned operations reviews, including the Mission Operations Reviews (MORs) and Operational Readiness Reviews (ORRs). The SMO will coordinate with the ESDIS Mission Operations Manager to ensure that the ESRs complement and do not overlap the operations reviews. This coordination, as well as the coordination with development organizations, may result in the adjustment of proposed schedules to provide maximum benefit from the ESRs and other planned ESDIS reviews.

Proposed ESR Format: Each of the reviews would follow the same basic format, but the specific content would focus on the stated objectives of the review. The basic format would include the following items for presentation:

I. Introduction (presenter to be designated by ESDIS SMO)
Expected duration: about .5 hour
- Purpose of the Review (How we got here)
- Scope of the Review (with agenda)
- ESDIS Organization
- ESDIS Management and Development Approach
- EGS Master Schedule
- Program Status Changes

II. System Overview (presenter to be designated by ESDIS System Engineering Manager)
Expected duration (about 2 hours)
- System and Operations Concepts
- System and Data Architecture

III. System Engineering Management (presenter to be designated by the ESDIS System Engineering Manager)

Expected duration: about .5 hour

- Scope and schedule of SE activities
- Requirements management activities and status
- Interface management activities and status
- System and information architecture activities and status
- System modeling activities and status
- System risks and issues with resolutions or current actions (include management, technical, and operational risks, such as instances where requirements have been changed but associated contractual modifications have not been made)

IV. EGS Development, as identified in Figure 2 (presenters to be designated by the appropriate ESDIS Managers)
Expected duration: about .5 to 1 hour per development area

- Implementation status (using life-cycle milestone events, milestone schedule, and critical path chart)
- Developer test plans and status
- Risks and issues with resolutions or current actions; include management, technical, and operational risks, such as the availability of required COTS products

V. EGS Integration Test, and Certification (presenters to be designated by the appropriate ESDIS Managers)
Expected duration: about 2 to 3 hours

- EGS I&T approach, including, approach to EGS integration and test, approach to providing I&T data, tools, and environment, approach to capability and interface validation/verification, and I&T risks and issues
- Component Testing Plans, Status, and Schedules
- System I&T Plans, Status, and Schedules
- System Certification Plans, Status, and Schedules
- Operation Readiness Plans, Status, and Schedules

VI. Summary (presenter to be designated by the ESDIS SMO)
Expected duration: about .25 to .5 hour

- Review of identified risks and issues
- Planned follow-on activities, including discussion of upcoming Operations Reviews

VII. Wrap-Up (presenter designated by ESR Chair)
Expected duration: about .25 hour

- Assignment of actions for risk and issue resolution

Review Logistics: The SMO would be responsible for the planning and coordination of the three reviews. The chronology for review planning would be as follows:

- The specific date will be established five months prior to the review. For ESR 1 the date will be established no later than September 1, 1995. The date will be determined by the

SMO in cooperation with other ESDIS Project Managers and will be coordinated with on-going implementation activities.

- At least 3.5 months prior to the review, a presenter or contact point for each presenting organization will be identified. If the presenters are not identified, a specific contact must be identified to support planning and coordination activities. In addition, the detailed agenda with time allotments, presentation format, and review logistics will be established in cooperation with review participants or representatives.

- At least 2 months prior to the review a meeting of all presenters or presenter contacts will be held to review the system baseline on which the review will be based. Materials for this review will be provided by the representative for the system requirements presentation. To facilitate understanding of EGS status as a single entity, this material will be used as the basis for each of the presentations. Any inconsistencies among presenters (e.g., the requirements, schedules, or integration and test approach) will be worked to closure to the maximum extent possible prior to the ESR. Those inconsistencies not resolved will be specifically identified as issues during the ESR, with appropriate actions identified to facilitate closure. ESR splinter groups will be scheduled as time permits for additional resolution. The SMO will provide continuing coordination and follow-up meetings with presenters as required to ensure consistency within the ESR.

- At least 1 month prior to the ESR, the audience or invitees will be notified of the schedule and agenda. An ESR Board will be jointly identified by Code 300 and the ESDIS Project. The ESR Board will become the governing body for the review. It will include members from across the GSFC, as well as EOS advocates from outside of GSFC and NASA. The Board will be responsible for identifying and documenting, risks, issues, and inconsistencies that need further attention. These will be identified in Requests for Action (RFAs) by the Board and assigned to the appropriate ground system organization for resolution. The Board will also consider RFAs from the audience when received through a recognized sponsor.

- At least 2 weeks prior to the ESR, a dry-run will be held. The dry run will be conducted by the SMO.

The Code 300 ESR Board will conduct the review. A review secretary appointed by the Board will record RFAs identified by the Board or submitted by a recognized sponsor. All action assignments will also be recorded by the review secretary. At the end of the review, a representative of the Board will review the list of RFAs and organizations responsible for their resolution. Actions will be administratively tracked to closure using the SMO issue close-out process currently under definition. RFA closure will be determined by the ESR Board based on recommendations from a tracking sponsor who will be assigned by the SMO.